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REMARKS

Claims 1-11 remain present in this application.

The title, specification, and claims 1, 3, 5 and 8 have been amended, and claims 9-11 have been presented. Reconsideration of the application, as amended, is respectfully requested.

Objection to the Specification

The title stands objected to as not being descriptive, and the specification stands objected to for having certain misspelled words. In view of the foregoing amendments, it is respectfully submitted that these informalities have been addressed. Reconsideration and withdrawal of any objection to the specification are respectfully requested.

Rejection under 35 USC 112

Claims 1 and 5 stand rejected under 35 USC 112, second paragraph. This rejection is respectfully traversed.

In view of the foregoing amendments, in which the phrase "such as" has been removed from these claims, it is respectfully submitted that all claims particularly point out and distinctly claim the subject matter of the instant invention. Reconsideration and withdrawal of the 35 USC 112, second paragraph rejection are respectfully requested.

Amendments to the Claims

It is noted that the preamble of independent claims 1 and 5 has been amended for clarity. Also, the dependency of claim 8 has been corrected, and a typographical error has been corrected in claim 3. Support for the changes to claims 1 and 5 can be found on page 4, lines 4-6, of the originally filed specification, and it is therefore respectfully submitted that no new matter is present.

Rejection under 35 USC 103

Claims 1-8 stand rejected under 35 USC 103 as being unpatentable over Scoll et al., U.S. Patent 7,020,853, in view of Li, U.S. Patent 6,775,806. This rejection is respectfully traversed.

The present application discloses a file conversion system and a method for converting an output file generated by a circuit design program into a converted file for a circuit layout program. The circuit design program generates the output file for use by the circuit layout program. The system of the application provides a unified naming rule for a designer to utilize for circuit design using a circuit design program. When the circuit design is finished, the output file generated by the circuit design program will include a plurality of circuit elements with a unified set of names. The system of the application converts the output file into the converted file based on the circuit elements having the unified set of names. Therefore, when the circuit layout program reads the converted file, the attributes of each circuit element will be automatically established in accordance with the unified set of names. This saves time by bypassing the need to re-input the attributes of each circuit element into the circuit layout program.

Skoll et al. discloses a design analysis workstation for analyzing integrated circuits. Skoll et al. provides an analysis method for analyzing digital image-mosaics captured during deconstruction of an IC and a wire labeling procedure, as can be seen in FIG. 12. However, as has been acknowledged by the Examiner, Skoll et al. neither teaches nor suggests converting the output file into the converted file, based on the unified set of names in the rule database.

The Examiner asserts, however, that Li teaches a rule database which stores rule definitions of a plurality of fields. In particular, the Examiner asserts that Li teaches extraction of rule definitions for the production of a converted file. The patent to Li discloses IC design software having a rule database, user interfaces and modified function. However, Li does not disclose or teach *automatically* converting the output file into the converted file according to the unified set of names. The Examiner has referred to column 2, lines 31-33, which set forth that "the appropriate rules files contained in a database of rules files are identified and invoked by DIVA®, *manually by a design engineer*" (emphasis added). Accordingly, the design engineer must manually prompt DIVA® to identify and invoke the rules files.

However, the conversion module 43 of the present application "is used to analyze the output file 20 generated by the circuit design program 10 to generate more than one field. The analysis employs an API to perform format conversions. The converted fields, property database 41, and rule database 42 satisfy the same naming rules. Once the format conversion is completed, the conversion module 43 extracts the rule definitions of each field from the rule database 42 to perform settings. The conversion module 43 also automatically adjusts the property definitions of individual fields. Finally, a converted file 50 is produced" (see page 4, line 20 through page 5,

line 1). Accordingly, unlike Li, the conversion module of the present application automatically converts the output file into the converted file according to the unified set of names.

The dependent claims set forth certain features which are additionally allowable over the prior art of record. Claims 4 and 6 set forth that the user interface is compatible with a spread sheet program. Claim 3 sets forth that the user interface provides editing commands for the user to edit the displayed fields, property definitions, and rule definitions. As is discussed in the specification beginning on page 5, line 9, the user interface "is used to display the contents of the layout data converted by the conversion module 43. The contents include various fields and the associated property definitions and rule definitions. In order for the circuit design engineer to perform manual adjustments and settings, the UI 44 further contains a complete set of editing commands so that the engineer can use an input device (such as a keyboard) for editing." Li, however, simply recites "a layout tool to modify the data object characteristics stored at the varied object addresses with a correction function to produce modified data objects" (column 6, lines 22-25). In Li, the data object characteristics that can be varied include, "placing a data object at one or more of the locations that did not previously have a data object... modifying characteristics of an existing data object... to increase the probability that the same would satisfy the design rules" (column 5, lines 40-52). Accordingly, although Li provides means for varying object data, Li does not provide editing commands for the user to edit the displayed fields, property definitions, *and* rule definitions, as is found in the present application. Accordingly, neither Skoll et al. nor Li teach or suggest these features.

In view of the foregoing amendments and remarks, it is respectfully submitted that the prior art utilized by the Examiner fails to teach or suggest the system and method of independent

claims 1 and 5 of the present application, as well as their dependent claims. Reconsideration and withdrawal of the 35 USC 103 rejection are respectfully requested.

Newly Presented Claims

Certain dependent claims have been added, which should be allowable based on their dependencies from allowable claims 1 and 5. These newly presented dependent claims also set forth additional limitations which are not found in the prior art utilized by the Examiner. In particular, claim 9 recites that the property database includes the unified set of names and corresponding attributes of circuit elements. Claims 10 and 11 recite that the converted file is generated by extracting the attributes of circuit elements from the property database by comparing names of circuit elements.

Conclusion

Favorable reconsideration and an early Notice of Allowance are earnestly solicited.

Because the additional prior art cited by the Examiner has been included merely to show the state of the prior art and has not been utilized to reject the claims, no further comments concerning these documents are considered necessary at this time.

In the event that any outstanding matters remain in this application, the Examiner is invited to contact the undersigned at (703) 205-8000 in the Washington, D.C. area.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

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Respectfully submitted,

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~~ASSISTED GENERATING~~ FILE CONVERSION SYSTEM AND METHOD FOR ~~LAYOUT DATA CONVERSIONS~~CONVERTING AN OUTPUT FILE GENERATED BY A CIRCUIT DESIGN PROGRAM INTO A CONVERTED FILE FOR A CIRCUIT LAYOUT PROGRAM

BACKGROUND OF THE INVENTION

Field of the Invention

The invention relates to a data processing system and method. More particularly, the invention relates to a system and method that, during a layout process, converts and adjusts layout data generated by other programs and ~~output~~ outputs a result to assist other programs for actual layout designs.

Related Art

Normal layout processes involve two stages (see FIG. 1). The first stage is the circuit design. A circuit design engineer uses a circuit design program 10 (such as ConceptHDL) to manually set the attributes of each circuit in this stage. Afterwards, the circuit design program 10 generates a corresponding output file 20. A circuit layout program 30 (such as Allegro) reads in the output file 20 and enters the circuit layout stage. In this stage, the circuit design engineer has to perform rule setting processes for each circuit. After all this is done, the circuit layout program 30 can generate a final circuit diagram.

Although the above-mentioned layout process ~~has used~~ uses individual professional programs to assist circuit layout designs, there are still the following problems:

(1) There is no integration mechanism for existing programs. Since these professional programs can only provide simple operational mechanisms, the circuit design engineers have to manually perform the settings in the layout process. As these programs are not fully integrated, the engineers have to familiarize themselves with different program operation interfaces and repeat the same settings in different programs. This inevitably results in ~~waste in~~ wasted manpower and time.

(2) There is no checking mechanism in existing programs. Since these professional programs cannot automatically check the contents set by the circuit design engineer, he or she has to spend extra time to check the circuit settings during different stages of the layout process. When an error is found, the engineer has to go back to the previous stage to do the settings again. This is particularly inefficient when many errors occur in a complicated circuit design.

Therefore, it will be extremely helpful if the layout data generated by different professional programs can be effectively integrated and automatically ~~check~~checked. It is also helpful if ~~one can provide~~ a common, friendly user interface can be provided for the engineer to perform layout setting and checking. It is believed that this can greatly simplify the layout process and reduce chances of errors.

SUMMARY OF THE INVENTION

The invention provides an assisted generating system and method for ~~lyout~~layout data conversions. With reference to FIG. 2, a primary technical means of the invention is to use an application programming interface (API) provided by the disclosed ~~conversion~~ conversion module 43 to convert an output file 20 generated by an existing circuit design program 10 (such as ConceptHDL). Rules predetermined in a property database 41 are employed to set various fields. Properties predetermined in a rule database 42 are employed to adjust the properties of abnormal fields. Finally, ~~it produces~~ a converted file is produced that can be processed by a circuit layout program 30 (such as Allegro) for actual layout designs.

The invention further provides a user interface (UI) 44 that is compatible with a spread sheet program (such as EXCEL). This enables the circuit design engineer to check all circuit settings (including property settings and rule settings) immediately. It also provides an editing function for the ~~enginner~~ engineer to make immediate adjustments.

To achieve the above-mentioned goals, the disclosed system uses a data conversion assisted generating system 40 to produce the layout data. It contains the following modules: a property database 41, a rule database 42, a conversion module 43, and a UI 44.

The disclosed assisted generating method for layout data conversions includes the following steps. First, an output file is obtained for analysis. The system then performs the conversion of more than one field. The system adjusts properties, sets rules, and displays them in the UI. Finally, a converted file is output for actual layout designs.

Further scope of the applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings, which are given by way of illustration only, and thus are not limitative of the present invention, and wherein:

FIG. 1 is a schematic view of the conventional layout processing;

FIG. 2 is a schematic view of the disclosed assisted generating system and method for layout data conversions;

FIG. 3 shows the main procedure of the invention; and

FIG. 4 shows an adjustment procedure of the invention.

DETAILED DESCRIPTION OF THE INVENTION

As described before, a conventional layout process is shown in FIG. 1. The circuit design ~~enginner~~ engineer has to use a circuit design program 10 (such as ConceptHDL) to manually set the properties of a circuit in the circuit design stage. Once the circuit design program 10 produces an output file 20 to a circuit layout program 30, the engineer then manually set rules in the circuit. This ~~indeed~~ renders more errors and a low ~~effieiney~~ efficiency in the layout process.

The invention provides an assisted generating system and method for layout data

conversions. With reference to FIG. 2, an assisted generating system for data conversions 40 is used to convert and generate layout data. The system 40 includes at least the following modules:

(1) A property database 41. ~~It~~ This database stores the definitions of properties for more than one field. Since each circuit layout contains different property definitions, the disclosed property database 41 uses a unified set of names to define all circuits. The properties of each kind of circuit are defined explicitly. Therefore, as long as the circuit design by the engineer follows the unified set of names defined therein, the associated property definitions for each circuit can be readily found from the property database 41.

(2) A rule database 42. ~~It~~ This database stores the ~~definitions~~ definitions of rules for more than one field. Since each layout circuit contains a different set of rule definitions, the disclosed rule database also unifies the names of all circuits, defining the rules that each named circuit has. Therefore, as long as the circuit designed by the engineer follows the unified set of names, the associated rule definitions can be readily found from the rule database 42 and filled into the corresponding fields once the output file 20 generated by the circuit design program 10 is obtained.

The above-mentioned property database 41 and the rule database 42 have to satisfy the same naming rules. The naming rules can be defined by the user. Once the names are defined, the properties and rules of individual ~~fileds~~ fields in the layout data can be identified for checking and setting.

(3) A conversion module 43. ~~It~~ This module is used to analyze the output file 20 generated by the circuit design program 10 to generate more than one field. The analysis employs an API to perform format conversions. The converted fields, property database 41, and rule database 42 satisfy the same naming rules.

Once the format conversion is completed, the conversion module 43 extracts the rule definitions of each field from the rule database 42 to perform settings. The conversion module 43 ~~It~~ also automatically adjusts the property definitions of individual fields. Finally, a converted file 50 is produced.

The part of adjusting the property definitions of individual fields mainly determines

whether the property settings in each field are normal. If they are abnormal, the system automatically extracts the appropriate property definitions from the property database 41 and fills them into the field to ensure the integrity of the circuit settings. Besides setting adjustments, the ~~conversion~~ conversion module 43 ~~furhter~~ further highlights the adjusted fields so that the engineer can immediately see whether he or she needs to manually make adjustments. This also ensures the correctness of the layout data.

(4) A user interface (UI) 44. ~~It~~ This interface is ~~sued~~ used to display the contents of the layout data converted by the conversion module 43. The contents include various fields and the associated property definitions and rule definitions. In order for the circuit design engineer to perform manual adjustments and settings, the UI 44 further contains a complete set of editing commands so that the engineer can use an input device (such as a keyboard) for editing.

In a preferred embodiment of the invention, the UI 44 has an interface compatible with other spread sheet programs (such as EXCEL) for the convenience of editing and browsing.

FIG. 3 shows the main flowchart of the invention. ~~We explain its~~ The details are explained with simultaneous reference to FIG. 2. First, the data conversion assisted generating system 40 obtains an output file 20 generated by the circuit design program 10 (step 100). The analysis is performed using the API provided by the ~~conversion~~ conversion module 43. Each field in the output file 20 is converted (step 200) so that the layout data in the format specific to the circuit design program 10 are changed into ~~ones~~ data that can be processed by the data conversion assisted generating system 40. That is, the contents in the output file 20 are converted using a definite set of naming rules. The ~~ssystem~~ system then adjusts properties, sets rules, and displays the results on the UI (step 300). This step is mainly used to deal with abnormal fields. The details will be explained with reference to FIG. 4. Finally, the adjusted layout data are converted into a converted file 50 that can be processed by the circuit layout program 30 (step 400) for subsequent layout processes.

When entering step 300, the data conversion assisted generating system 40 performs automatic adjustments to the layout data. First, each field is read into the system (step

310). The rule definition of each field is extracted from the rule database 42 for performing settings. Steps 320 through 340 are executed for each of the fields, adjusting the property definitions of all fields. Step 320 checks the field being read in. Step 330 determines whether a particular field is abnormal (such as no data, incorrect data, etc). If there is no error or the abnormal field is corrected, the system enters step 340 to check if there ~~is~~ are any other field to be checked. If there ~~is~~are other fields to be checked, steps 320 through 340 are repeated.

When step 330 discovers an abnormal field, the conversion module 43 ~~extract~~ extracts the appropriate property definition from the property database 41 to correct the field (step 331). All of the corrected fields are highlighted by the conversion module (step 332). The purpose of this step is to allow the circuit design engineer to quickly confirm the correctness of the layout data while browsing on the UI 44. Once all adjustments are done, the system returns to step 340.

After all layout data are checked (step 340), the conversion module shows the results of all fields on the UI 44 (step 350) and then enters step 400. In addition to browsing, the UI 44 also provides editing commands for the engineer to edit the fields, property definitions, and rule definitions using an input device (such as a keyboard). In a preferred embodiment of the invention, the UI 44 provides an interface compatible with a spread sheet program. Thus, the engineer can conveniently browse and maintain the properties and rules of the layout data. Nonetheless, the UI 44 can be designed according to practical needs and is not limited by the disclosed embodiments herein.

After step 400, the converted file 50 produced by the invention is transmitted to the circuit layout program 30 for subsequent layout processes.

~~Certain variations would be apparent to those skilled in the art, which variations are considered within the spirit and scope of the claimed invention.~~The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.